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BUREAU OF ENTOMOLOGY

FOREST INSECT INVESTIGATIONS

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FOREST INSECT SURVEYS

SIERRA NATIONAL FOREST

SEASON OF

1935

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by
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Berkeley, California
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Forest Insect Laboratory
Berkeley - California
December 18, 1935

FOREST INSECT SURVEYS

SIERRA NATIONAL FOREST -

Season of 1935

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FOREST INSECT SURVEYS - SIERRA NATIONAL FOREST

SEASON of 1935

INTRODUCTION:

The 1935 forest insect survey of the Sierra National Forest was carried out by the Bureau of Entomology and Plant Quarantine during the months of September and October. The field work was conducted during two separate periods. The first period was from September 8 to 14. The second period was from September 30 to October 8. During the first period, J. E. Miller and J. E. Patterson surveyed the Chiquito Basin, Rock Creek region, and a part of the Bass Lake Unit. The field crew during the second period of work consisted of G. E. Struble, J. C. Yuill and J. E. Patterson.

The cost of the survey was carried jointly by the Bureau and the Sierra National Forest. Salaries and subsistence were paid by the Bureau. Cost of transportation was assumed and carried by the Sierra Forest.

EXTENT AND TYPE OF SURVEY MADE:

Owing to limitations imposed by financial resources and available time, the survey was limited to those areas wherein permanent regional survey plots had been established; and to other areas of high entomological priority where known susceptibility to insect infestations of normal or higher proportions were suspected to exist. These requirements excluded the marginal stands on the western front and most of the back country timbered with mixed stands of pine and fir. Logged areas were also excluded.

The extensive general areas covered by the survey are: The Chiquito Basin and adjacent areas north to Beasore Meadows, Rock Creek and Ellis Meadow, Cascadel and Rogue Ranch, Fence Meadow, Blue Canyon, Bass Lake and environs.

The methods used are standard for this type of survey and consisted of 100% cruise of the check plots, and traverse strips and road counts in contiguous areas. In areas where no check plots were established the survey was limited to road counts and topographic viewing from visibility points.

GENERAL INFESTATION CONDITIONS:

In general, the western pine beetle infestations have decreased over the greater part of the area covered by the survey. The most marked decrease has occurred around Bass Lake and in the Chiquito Basin, where the present status is decidedly subnormal, and where recent losses approximate only a fraction of those of a few years past. However, infestations of this beetle on certain other areas have not followed the same trend and are again approaching epidemic conditions. Local centers of this character have sprung up on

the Cascadel and Fence Meadows units and show all the characteristics and aggressiveness of past epidemics. Other areas such as Rock Creek and Blue Canyon are intermediate between these two extremes, yet these infestations are not above normal for the stands infested.

The mountain pine beetle has largely disappeared from its former haunts and losses that can be chocked up against it are negligible in quantity and extent. It still persists in the sugar pine stands at Fence Meadows but is a minor factor in the infestations on this area.

Flathead bark-borers are responsible for the greater losses in stands on the poorer, exposed sites and constitute the bulk of the infestations in the lower Shiquito area and certain parts of the Rock Creek units. These beetles are primary in attacks on Jeffrey pine in these units and are also intermixed with broods of the western pine beetle in ponderosa pine.

The engraver beetles (Ips spp.) are present throughout the Sierra infestations but play only a minor role in comparison with their past activities.

RECENT CONTROL WORK AND RESULTS:

Due to the unusually low status of barkbeetle infestations generally throughout the forest in 1934 and in the spring of 1935 only a limited amount of control work was undertaken.

Increased infestation caused by the 1934 winter broods of the western pine beetle occurred locally in the Hugh Ryan canyon which was treated in the spring period from April 15 to May 3. This infestation was concentrated in ponderosa pine; the bulk of the trees treated being of this species although a few sugar pine trees were also treated. An area of 4080 acres was covered and a total of 285 infested trees were treated. The infestation was largely scattered over the control areas and averaged 44 trees per section. The total volume treated was 835 MBM. Standard control methods were used on this project; the trees being peeled and the bark burned.

Other control work carried out during the period from November 20, 1934 to May 18, 1935, was located east of Hugh Ryan and contiguous thereto, and around Bass Lake, (see map). This work was accomplished by CCC, SERA, and FERA crews. The total acreage treated was 7840 acres. A total of 446 trees containing a volume of 542,640 board feet were treated by the burning method. The trees treated were principally ponderosa pine infested mostly with broods of the western pine beetle.

These control projects have been reported by Assistant Forester J. W. Buck in reports (with map) dated November 16, and December 3, 1935.

The results of the control work done on all of these areas has been effective in materially reducing the insect losses. The immediate result in Hugh Ryan is a decrease in the losses of 88% as shown by an examination made in the Fall of 1935. The infestation treated amounted to an average of 44 trees per section. The first subsequent loss averaged only 6 trees per section.

The control work done on the other areas treated effected a reduction of 60%. While the reduction in these losses has not equalled that secured in Hugh Ryan, it is satisfactory for the type of forest worked. The forests surrounding Bass Lake are of the marginal type and are subjected to intensive summer use and are comparable in this respect to park forests. The recurring infestations are usually somewhat higher than in purely commercial stands.

INFESTATION CONDITIONS IN UNIT AREAS:

Plot cruise data were secured on all units except Hugh Ryan and Bass Lake. These same plots have been cruised annually since 1930 and the resultant data are given in Table I, which includes the annual losses by sections for the years 1930, 1931, 1932, 1933, 1934, and the estimated losses for 1935. Table II gives the estimated losses for 1935 on the entomological units included in this survey in terms of trees and volumes per section and per unit. The data in this table are based on plot cruises where available, or in the absence of such data, are based on road traverses and extensive observation.

Hugh Ryan Unit:

A subnormal infestation of mainly the western pine beetle in ponderosa pine is present in this unit. Infested trees are greatly scattered and occur mostly on the slopes leading back from Miami Creek. This infestation will average about 6 trees per section, or approximately 64 infested trees for the entire unit. The control work carried out on this unit in the spring of 1930, and mentioned in a preceding paragraph, was highly successful in reducing the losses which have shown no subsequent increase. No further control work is at present recommended.

Jackass Unit:

This unit, formerly a part of the Placer Unit, has been given primary rank because of different site and infestation characteristics which are not comparable to the balance of the Chiquito area. The current infestation is normal and has shown a decrease in losses of 14% since 1934. It will average about 30 trees per section over an approximate area of 10,000 acres. It is composed almost entirely of the western pine beetle in ponderosa pine.

Placer Unit:

The timber type on this unit varies considerably on different sites. Jeffrey pine predominates on the poorer sites on south slopes and on ridges. Ponderosa pine is the principal species along the stream courses and on the upper benches. Due to these characteristics of the forest, the insect infestations also vary greatly throughout the unit. Past losses have been relatively high and as a consequence have resulted in a great thinning of the forest on the poorer sites. A great amount of control work has been carried out on this unit during the past 15 years. The toll of insects have taken together with the cutting out of infested trees have resulted in a

ragged appearance over extensive areas. The photographs in the appendix (plate III) illustrates this thinning on one area. The greatest losses in the Jeffrey pine are caused by flathead bark-borers. The Jeffrey pine beetle, while present in these infestations, plays only a minor part in the resulting losses. The western pine beetle and flathead borers are both primary agents in the ponderosa pine infestations. Accurate figures on the annual losses since 1931 are available from previous control work and plot cruises. A comparison of these infestations in terms of trees per section is given in the following table:

Year	Trees per Section	Increase or Decrease % Over Preceding Year
1931	210	
1932	178	-16%
1933	90	-50%
1934	96	+ 7%
1935	36	-62%

The current infestation is substantially less than at any other time during this period and is decidedly subnormal. It will approximate 875 infested trees for the unit. Since a further reduction in losses is expected no control work is recommended.

Rock Creek Unit:

The topography of this unit is considerably varied and broken by several rough stream channels which divides it into a number of smaller areas. The timber types are correspondingly varied and are composed of several different sites. In general, past infestations have been largely confined to the poorer, exposed sites on the ridges and south slopes, although scattered trees have been taken throughout the unit. These past losses have not quite reached epidemic proportions yet have been maintained relatively high in proportion to the stumpage. The high point seems to have been reached in 1931 as evidenced by the number of trees killed in that year and which are now visible as snags. As a result of control work and annual examinations, we have yearly estimates of the infestations for the past 5 years. These are:

Year	Trees per Section	Increase or Decrease % Over Preceding Year
1931	100	
1932	80	-20%
1933	52	-35%
1934	54	-35%
1935	35	+ 3%

These data show that the trend of the infestations during recent years has been toward decreased losses, and since there are no present indications of change toward higher losses, control is not recommended.

Cascadel Unit:

The Cascadel unit, as at present organized, includes that part of the

former Ellis Meadow area lying south of the summit ridge in the Whiskey Creek drainage in addition to the main Cascadel area. It includes the Ellis Meadow plot # 10. The infestation throughout the unit as now constituted is a homogeneous entity and should be so considered in any plans for surveys of control. The history of the successive insect infestations in these stands goes back to 1921. During this 15 year period infestations have waned and waxed periodically and the result has been a heavy toll taken from all age classes. The two photographs in Plate IV illustrate the depletion of these stands better than word description. A comparison of the annual infestations for the past 5 years is obtainable from the following table of losses computed on a per section basis:

Year	Trees per Section	Increase or Decrease % Over Preceding Year
1931	1,140	-
1932	418	-63%
1933	132	-68%
1934	58	-56%
1935	248	+330%

The high losses in 1931 and 1932 were largely due to an epidemic of engraver beetles, (Ips spp.), in conjunction with the western pine beetle. The principal losses have been in ponderosa pine although relatively high losses have occurred in sugar pine in the higher elevations. These losses have been due to attacks by the mountain pine beetle, the engraver beetles, and flatheaded borers. Intensive control work was carried out in the spring of 1932 in the treating of the 1931 overwintered infestation. The result of this work is shown in the above table and secured a reduction of 63%. The trend of subsequent losses up to 1935 have been downward. However, the infestation of 1935 has shown decided epidemic tendencies. A definite increase of the fall infestation over that of the summer of last season, together with the pronounced grouping tendency of late fall attacks indicates that another epidemic cycle is now under way. The ratio of summer to fall attacks as found in September was 45 to 70, or a 5:7 ratio. The current infestation differs from the previous epidemic in that it is composed almost entirely of the western pine beetle in ponderosa pine. It is recommended that control of this rising epidemic be undertaken early in the spring of 1936. Due to the accessibility of the area, advanced fading of infested trees, and other favorable working conditions, the spring period is preferred for control operations.

The infested area consists of about 7,500 acres and extends from the brush fields on the south and west, north to the summit ridge near Ellis Meadow, and east to a tangential line intersecting Source Peak. The overwintering infestation of 1935 will approximate 800 trees with a volume of about 1,000,000 board feet. This loss amounts to about 130 board feet per acre. The highest concentration is on the southwest slope of Whiskey Creek basin where it will approximate 180 infested trees per section. The infestation diminishes eastward but extends across Mormon Hill with almost equal intensity. Grouping of the infestation is a characteristic of the epidemic areas.

Bass Lake Unit:

Includes the environs of the lake west to the summit of Goat Mountain ridge, north to near the township line, east to the logged areas, and south to the junction of the Madera Road. This unit includes all of the recreational region about the lake and also all the contiguous areas thereto that have any bearing on the infestations of the unit. Past insect losses have been high; the infestation of 1931 reaching the peak of epidemic conditions. The infestation continued in aggressive form through 1932 and 1933 showing, however, some abatement in the latter year. Enormous losses in number of trees and volume resulted, especially on areas adjoining the north end of the lake, where on a few sections the loss aggregated nearly 50% of the stand.

The greater portion of the unit was covered by control work in the late spring, summer, and fall of 1935 by crews of CCC men from a local camp. Additional control work of a maintenance character, principally on the recreational areas, was carried out by the same agency in the fall of 1934 and in the spring and summer of 1935. Today this area is remarkably free of insect infestations. Several recently attacked trees are visible on the east exposure of Goat Mountain, but they are widely scattered and represent an infestation of only low endemic character. The current infestation is estimated to be 15 trees per section; or a total of 210 trees for the unit.

No control work under regular set-up is recommended. However, because of the high recreational value of the riparian stands maintenance control work is desirable. Such control could be satisfactorily accomplished incidental to other work in the spring and fall periods by a small crew of CCC enrollees or other men from local camps.

Fence Meadow Unit:

The current, or 1936, infestation is greatly in excess of that of the two preceding years, with indications of further increase. It is concentrated around the check plot which is the east one-half of section 7. Infestation data secured on this check plot are comparable in extent and intensity to the surrounding areas of the unit although the infestation gradually diminishes toward the outer limits. The total loss in 1934 on the check section was 36 trees; that of 1935 is estimated at 176 trees, an increase of 140 trees, or nearly 400%. Further indications of impending epidemic conditions is furnished by the increase of winter brood trees over summer brood trees, which is in the ratio of 32 to 56. The average loss per acre during 1935 amounted to 254 board feet throughout the unit. This loss is far above normal, and due to the high stumpage values represented, and also because of the aggressive character of the infestation, it is recommended that control work on this area be undertaken early in the spring of 1936. Here, as on the Cascadel unit, spring control work is preferred because of late fading of winter brood trees.

Blue Canyon Unit:

Following subsidence of the barkbeetle epidemic of 1930-31, the annual infestations on this unit have been quiescent and the losses have not been

above normal for these stands. The annual trend since 1932 has been toward decreased losses both in number of trees taken by insects and loss in board feet per acre. A graphic picture of the rise and decline in number of trees killed per section during the period 1930 to 1935 is given in the following table:

Year	Trees per section	Increase or decrease % over preceding year
1930	152	
1931	584	+284%
1932	318	- 45%
1933	69	- 78%
1934	32	- 53%
1935	104	+225%

The low point of the period occurred in 1934, and while there was an increase in 1935 the infestation is far from being epidemic for these stands. The estimated average loss for the entire unit is 50 trees per section. No control work is recommended for the present.

RECOMMENDATIONS:

Control of the existing endemic infestations on Hugh Ryan, Jamison, Placer, Rock Creek, Bass Lake, and Blue Canyon units is not considered advisable since the insect loss is normal or subnormal.

Recent increases of a highly epidemic character have occurred in the infestations on Cascadel and Fence Meadow units. Control of these infestations is recommended. These units should be treated in the spring of 1936.

TABLE I

PLOT LOSSES - SIERRA NATIONAL FOREST

PER SECTION BASIS

Plot Designation	1930			1931			1932			1933			1934			1935			Rel. to 1934
	Trees	Volume BM	BM per Acre	Trees	Volume BM	BM per Acre	Trees	Volume BM	BM per Acre	Trees	Volume BM	BM per Acre	Trees	Volume BM	BM per Acre	Trees	Volume BM	BM per Acre	
RS-7 Cascade1	402	165,740	259	1,140	996,820	1,558	418	366,860	573	132	142,210	222	58	42,280	66	246	173,680	271	+311%
RS-8 Placer	44	11,560	18	210	138,480	216	178	111,200	174	90	85,820	134	96	70,140	110	70	30,140	47	- 57%
RS-9 Jackass	50	25,920	42	100	154,320	241	72	172,280	270	72	176,420	276	56	76,140	119	26	65,480	102	- 14%
RS-10 Ellis Meadow	156	245,360	383	760	1,018,400	1,582	368	467,520	730	96	151,040	236	40	29,120	45	24	90,400	141	+213%
RS-12 Fence Meadow	706	280,100	437	498	704,120	1,100	592	1,811,250	2,848	104	380,760	563	56	85,280	135	176	407,580	636	+371%
RS-15 Blue Canyon	152	242,360	379	564	878,080	1,372	318	520,660	813	68	91,420	143	52	49,880	78	164	228,760	357	+367%
Totals	870	972,060	1,518	3,292	3,864,220	6,069	1,918	2,949,170	4,607	564	1,007,670	1,574	318	353,960	555	588	996,020	1,554	
Averages	145	165,343	253	546	647,370	1,011	319	491,530	768	92	167,960	262	53	58,990	92	98	166,000	259	+182%

TABLE II

ESTIMATED INSECT LOSS IN 1935 PER SECTION-PER UNIT

SIERRA NATIONAL FOREST

UNIT	Timbered Secs.	Timbered Acres	Per Section Trees	Per Section Vol. BM.	Per Unit Trees	Per Unit Vol. BM.	Loss per Acre BM
1. Hugh Nunn	8	5,000	8	17,600	64	140,800	28
2. Jackass	16	10,200	30	56,100	480	897,600	88
3. Placer	25	16,000	35	29,750	875	743,750	46
4. Rock Creek	16	10,200	35	42,000	560	672,000	66
5. Cascadel	12	7,600	120	84,000	1,440	1,008,000	132
6. Bass Lake	14	8,900	15	9,000	210	126,000	14
7. Tenge Meadow	12	7,600	70	161,000	840	1,932,000	254
8. Blue Canyon	10	6,400	50	80,000	500	800,000	125
Totals	113	71,900	363	479,450	4,969	6,420,150	763
Total Averages	14	8,988	45	59,931	621	802,520	95

U. S. BUREAU OF ENTOMOLOGY
AND PLANT QUARANTINE

SIERRA NATIONAL FOREST

CALIFORNIA

UNITS

1. HUGH RYAN
2. JACKASS
3. PLACER
4. ROCK CREEK
5. CASCADEL
6. BASS LAKE
7. FENCE MEADOW
8. BLUE CANYON

////. Control work by IMPNIRA crews

///. Control work by SERA, FERA, and CCC crews

PLATE I

BE9809
Stand conditions on the Jackass R. S. plot, Chiquito Basin. This view shows a portion of the better site stands on the south-east part of the plot and is representative of the larger part of the unit. The uniform spacing of the trees and absence of brush are characteristic of this forest. The barkbeetle loss in these stands has been high for the past ten years but is now much reduced.
Photograph by J. E. Patterson.

PLATE II

BE9808
Stand conditions on the Jackass R.S. plot, Chiquito Basin. Two large snags resulting from attacks of barkbeetles. The killing of trees of these large sizes represents a high loss in bpard feet per acre. These trees are ponderosa pine and were killed by the western pine beetle.

BE9808
Another view of the same area showing more recent loss. The larger snag in the foreground is a ponderosa pine and those in the background are sugar pine. The latter were killed by the mountain pine beetle. Many trees of the largest size have been killed on this plot during the past decade.

Photographs by
J. E. Patterson.

PLATE III

BE9810
Two views showing stand conditions on the Placer R.S. plot, Chiquito Basin. The ragged appearance of these stands has been brought about by insect activity of several years duration which has resulted in a great thinning of the larger trees on the poorer sites. The present cover consists largely of young trees and brush. Photographs by J. E. Patterson.

A portion of the Whiskey Creek Basin in the Cascadel unit. Two views of the same areas taken from the same point an an interval of four years, illustrating depletion of stand caused by barkbeetle epidemics. The upper picture was made in the fall of 1931 following the initial stages of an epidemic of the western pine beetle, Dendroctonus brevicomis, and the engraver beetle, Ips confusus. The light colored trees represent dead trees that died from attacks made in late 1930 and during the seasons of 1931. The lower picture was made in the fall of 1935 and shows the openings in the forest resulting from the felling of the trees killed during the epidemic period of 1930-1932. A comparison of the two pictures shows the extent and magnitude of the stand loss on these partially denuded areas. The areas in circles marked "B" are highly epidemic centers of from 30% to 80% stand loss and which are shown as recently killed in the upper picture, but as barren areas in the lower; due to dead trees having fallen in the interim. The group of faded trees in the lower left foreground of the upper picture had largely disappeared by the fall of 1935, four years later. Only two snags of this group are left standing.

The expansion of the recent infestation into stands which escaped the previous epidemic is shown in circles marked "A". An island of green trees surrounded by trees attacked and killed in 1931 is shown in the upper circle. The lower circle shows a group of trees attacked in 1935 in the island of green trees left by the first epidemic, and indicates the way successive infestations deplete these stands.

Other groups similar to this one appeared in 1935 and they indicate the beginning of another epidemic. Upper photograph by J. M. Miller; lower by J. E. Patterson.

(While the relative position of the principal parts are coincident in the above pictures there are some minor discrepancies in the location of these points. This result is due to the different foci of the lenses used in making them.)

PLATE IV

BE8455

BE8455

PLATE V

BE9803
Two faded ponderosa pine trees on the Cascadel Ridge which were recently killed by the western pine beetle. These trees were attacked by the summer brood of the beetle and were in the first stage of the red phase at the time the picture was made, September 12, 1935. Photograph by J. E. Patterson.

PLATE VI

BE9806
Basal section of standing ponderosa pine tree on summit of Mormon Hill, Cascadel unit, showing prominent pitch tubes formed at entrance to egg galleries of the western pine beetle. The heavy attack indicates a high population of beetles. This tree was attacked in the late summer of 1935.
Photograph by J. E. Patterson.

PLATE VII

BE9805
A large group of ponderosa pine snags near Ellis Meadow. This group represented over 100 dead trees killed by the western pine beetle. Many of the dead snags have fallen so that the picture shows only a part of the original group. These trees were killed in 1931 during the peak of the epidemic of 5 years ago. Photograph by J. E. Patterson.